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Sent:	Thursday, June 12, 2014 2:19 PM
To:	Gravatt, Dan; Field, Jeff; Washburn, Ben
Cc:	'Kirby Webster'
Subject:	TASC Q/A sent to WLL CAG Board
Attachments:	TASC TO1 R7 WLL QA#1_DRAFT_06-12-14.pdf

Hi Dan and All,

Attached is the draft copy of the TASC Q&A document sent to the CAG Board for their review. Unless they have concerns, I will plan on bringing copies to the CAG meeting on Monday.

Thanks.
Terrie

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TASC Responses to Community Questions #1
June 2014

Technical Assistance Services for Communities (TASC) has received several questions from community members verbally and by email. In order to inform and share responses with all community members, we have listed the questions and TASC answers below in this document. TASC paraphrased questions and provided context where appropriate.

The TASC contract provides EPA-funded technical support for communities living near hazardous waste sites. This support can include information assistance, community education and technical expertise. TASC is currently providing technical support to communities affected by the West Lake Landfill through the West Lake Landfill Community Advisory Group (CAG). Opinions stated in this document are those of the technical advisors to the West Lake CAG and do not necessarily represent opinions of EPA.

Q1: A copy of a paper by Dr. Robert Alvarez, "The West Lake Landfill: A Radioactive Legacy of the Nuclear Arms Race", dated November 21, 2013 was provided to TASC for review. TASC was asked for comments.

A1: Dr. Alvarez makes two recommendations and the paper is written to support these recommendations. The recommendations are:

1. "Radiation protection of workers who enter on or near areas where radioactive waste was dumped should be mandatory, as they are at Energy Department and commercially licensed radioactive waste sites."
2. "Finally, like other U.S. nuclear weapons legacy sites in the St. Louis, Missouri area, the U.S. Congress should seek to remove these radioactive materials and assure long-term stewardship responsibilities under the Formerly Utilized Sites Remedial Action Program (FUSRAP) managed by the U.S. Army Corps of Engineers and the U.S. Department of Energy."

TASC agrees with Dr. Alvarez's first recommendation. Specifically, if there is a risk of radioactively contaminated dust on the surface of the site that could potentially become airborne, workers on the site will not be protected from breathing radioactive particles unless they wear respiratory protection. Air monitoring alone provides no protection in the event that contaminated dust becomes airborne.

Regarding Dr. Alvarez's second recommendation, TASC appreciates Dr. Alvarez's position that the radioactive materials at the site should be removed. But, the trade-offs in short term and long term risks are complicated. In the short term, removal and transport seems more risky to the surrounding community than capping and monitoring. In the very long term of 1,000+ years, it would seem less risky if the radioactive wastes were not at the site because of the potential challenges of monitoring and maintaining the site for such a long time.

Q2: TASC was given a letter from EPA Director Brooks to Senator Blunt that mentions that EPA is investigating partial excavation and potential treatment technologies. We were asked if it would be appropriate for TASC to provide some educational materials on what each of these means and how they each may be accomplished.

A2: The TASC program is designed to provide educational materials on remedial activities and potential treatment technologies. We can work with the West Lake Landfill CAG to provide appropriate information when we know which technologies are being considered by EPA.

Q3: TASC was asked how the cost estimate range was determined for the alternative of "total removal of radiologically impacted material (RIM) with off-site disposal" described in the Supplemental Feasibility Study (SFS).

A3: The SFS Report explains that only three disposal facilities (U.S. Ecology's facility in Grandview, Idaho; the EnergySolutions facility in Clive, Utah; and Clean Harbors' Deer Trail facility in Last Chance, Colorado), have been identified that could accept RIM from the West Lake Landfill for off-site disposal. These companies provided unit costs for complete turnkey services for waste profiling and acceptance testing, waste transportation including all related fees and taxes, and waste disposal services including all related fees and taxes. The SFS Report doesn't specifically say that the cost range shown in the SFS is the lowest and highest of the 3 cost estimates provided, but that is likely the case. When/if removal and offsite disposal is actually contracted, it is likely that the three companies will have the opportunity to competitively bid for the work and the lowest bidder will likely be chosen. Costs in the SFS should be viewed as gross estimates that will be refined as the remedy is designed and services are actually contracted. Costs in the SFS provide +50/-30 percent level of accuracy meaning that actual costs are anticipated to be up to 50% higher and 30% lower than the estimated cost.

Q4: TASC was asked how the risk estimates in the SFS were determined and what the accuracy is for each of the three alternatives evaluated.

A4: It is difficult to make a statement about the accuracy of a risk assessment, as it involves a lot of calculations using both measured data and published exposure factors. The risk assessment is in Appendix H of the SFS beginning on page 1064 of the PDF. It appears to follow commonly accepted risk assessment protocol.

Human health risk assessment is a method used to estimate the increased risk of adverse human health effects as a result of exposure to environmental contaminants like those found at the West Lake Landfill Superfund site. Risk assessment is a 4-step process. *First*, identify the hazard. This is done by taking soil, water and air samples, as needed to find out what concentrations of contaminants people may be exposed to. *Second*, estimate the exposure pathways. This is done by evaluating all the ways a person could be exposed to the contaminants present at the site. Common exposure pathways are accidently ingesting or coming into contact with soil, drinking contaminated water and breathing contaminated air. *Third*, a dose-response calculation is made. It is a series of estimates of what could happen to a person's health if the person was exposed by a specific exposure pathway to a specific concentration of a contaminant. *Fourth*, the extra lifetime risk of health effects is estimated. This usually involves summing the specific risk calculations to develop a total risk value.

Table 12-1 in Appendix H of the SFS (copied below) presents hazard assessment results for accidents and traffic accidents during remedy construction, as well as risk assessment results for exposure to contaminants. The three columns of results are for the ROD-selected remedy of capping and monitoring the site, total removal of RIM and off-site disposal, and total removal of RIM and on-site disposal.

A compilation of short and long term risks calculated during this risk assessment is presented in Table 12-1.

Table 12-1 Compilation of Calculated Short-term and Long-term Risks

	Category of Hazard or Risk	ROD selected Value	Off-site Value	On-site Value
Short-term	Projected Incidence of Transportation Accidents [a]	6.1×10^{-01}	1.4×10^{00}	7.9×10^{-01}
	Projected Incidence of Industrial Accidents [b]	4.7×10^{00}	7.6×10^{00}	9.0×10^{00}
	Carcinogenic Risk to Reasonably Maximally-Exposed RadCon Tech during Remedy Construction [c]	7.2×10^{-05}	7.6×10^{-04}	7.4×10^{-04}
	Hazard Index for Reasonably Maximally-Exposed RadCon Tech during Remedy Construction [c]	6.8×10^{-03}	3.6×10^{-02}	3.5×10^{-02}
	Carcinogenic Risk to Reasonably Maximally-Exposed Off-site Resident during Construction [c]	3.3×10^{-06}	2.1×10^{-05}	2.0×10^{-05}
	Hazard Index for Reasonably Maximally-Exposed Off-site Resident during Remedy Construction [c]	5.7×10^{-03}	1.4×10^{-02}	1.4×10^{-02}
	Dose (TEDE) to Qualified Radiation Remediation Worker (mrem/y) [d]	5.0×10^{01}	2.6×10^{02}	2.6×10^{02}
Long-term	Carcinogenic Risk to Reasonably Maximally-Exposed Individual after Remedy Construction [e]	1.3×10^{-06}	$< 10^{-07}$	1.5×10^{-06}

[a] Dependent on mileage on public roads.
[b] Dependent on man-hours worked.
[c] Dependent on man-hours worked while RIM exposed and will vary depending on length of project.
[d] Annual dose limited by concentration and 1 year reporting period.
[e] Highest risks are in year 1.000.

Risk calculations are made using both site specific information from the site investigation and published exposure factors. For example, it is assumed for the calculations that an adult weighs 70 kg or about 154 pounds and a child weighs 15 kilograms or about 33 pounds. Other assumptions are also made using published factors for different exposure pathways. EPA's exposure factor handbook can be found at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/documents/efh-complete.pdf. The hazard assessments for traffic and construction accidents are based on published accident rates. As indicated in Table 12-1 accident risks depend on man-hours worked and mileage on public roads.

EPA generally considers extra cancer risk between 1×10^{-6} and 1×10^{-4} to be acceptable when planning Superfund site cleanups. This range is an extra risk of 1 in a million to 1 in 10,000 extra cases of cancer. For non-cancer health risks from exposure to hazardous chemicals, EPA calculates a hazard index, which compares the estimated dose from exposure to the compounds of concern to a dose that is expected to not cause human health effects. A hazard index of 1 or less is considered an acceptable risk for non-cancer health effects.

Q5: TASC was asked if the Bridgeton Landfill should also be a Superfund site because Ra-226 and Ra-228 have been found in ground water outside of OU1 (the radiologically contaminated areas of the West Lake Landfill – Area 1 and Area 2).

A5: Bridgeton Landfill is a permitted sanitary landfill that was permitted by Missouri Department of Natural Resources (MDNR) on November 18, 1985 and ceased accepting waste on December 31, 2004. It is part of the West Lake Landfill Superfund site, considered OU2 because radioactive waste was not identified in the

Bridgeton Landfill. OU1 includes areas with radioactive waste. The cleanup for OU2 is specified in the Record of Decision (ROD) for OU2.[1] It includes:

- Install landfill cover meeting the Missouri closure and post-closure care requirements for sanitary landfills
- Apply ground water monitoring and protection standards consistent with requirements for sanitary landfills
- Surface water runoff control
- Gas monitoring and control consistent with sanitary landfill requirements as necessary
- Institutional controls to prevent land uses that are inconsistent with a closed sanitary landfill site
- Long-term surveillance and maintenance of the remedy

It is not unusual to divide Superfund sites into different Operable Units that each have their own ROD specified remedy.

Q6: TASC was asked to provide information about the way the costs of the three cleanup alternatives were estimated in the SFS, particularly information about equipment maintenance and replacement over time. Concern was expressed about encountering similar equipment failures as has been experienced with the Bridgeton Landfill due to the subsurface smoldering event, freezing weather, etc.

A6: Estimated costs are in Appendix K of the SFS, beginning on page 1241 of the PDF. Specific cost estimates for the type of equipment maintenance and replacement referred to in the question do not appear to be included in the Operations and Maintenance (O&M) cost estimates. However, operation and maintenance cost estimates do include a 20% contingency, which could be used for the type of equipment repairs and replacements in question. O&M costs listed in Appendix K include mowing, adding soil and seeding the OU1 landfill cover and the cost of conducting five year reviews.

Q7: TASC was asked if there are records that indicate whether EPA and/or Missouri Department of Natural Resources (DNR) have ever done on-site and off-site testing for RIM and volatile organic compounds (VOCs) with equipment sensitive enough to measure amounts of RIM and VOCs that would pose chronic health effects from long term exposure from all the VOC's and RIM that have been and are being released into the atmosphere, water, and soils beyond the perimeter of the landfill?

A7: This question is about potential releases of contaminants outside of both OU1 and OU2 boundaries. TASC has reviewed ground water and air monitoring data to prepare fact sheets on these topics. In our data reviews, we have not noted any issues with equipment calibration, chain of custody, quality control, etc. that would make us suspect the validated laboratory data were not accurate. The reporting limits from laboratory reports that we have seen have generally been lower than EPA health screening levels, which should be low enough to permit analysis of chronic health risks. It is our understanding that Missouri Department of Health and Senior Services (DHSS) is evaluating their air quality monitoring data for chronic health risk, which is important since the odors from the Bridgeton Landfill have been ongoing for some time.

Q8: TASC was asked to look at a US Army Corps report titled, "Derivation of Site-Specific DCGLs (Derived Concentration Guideline Levels) for North County Structures", dated October 18, 2004. Questions regarding this document are:

1. In the Purpose paragraph, it states that an allowable exposure is up to 15 mrem per year, which, according to the paragraph, "equates $\underline{3 \text{ X } 10^{-4}}$ risk", which is 0.0003 or 3/10,000 or 1 of every 3,333. Is this correct?
2. What is the time duration of exposure that this risk factor is based on?

[1] ROD located at: http://www.epa.gov/superfund/sites/rods/fulltext/r2008070002358.pdf

3. Would this statistic apply to kids playing in playgrounds, recess yards, or ball fields?
4. Does the 15 mrem per year guideline from EPA also include the potential for cancer from the chemical toxicity of specific radiological compounds?

A8:

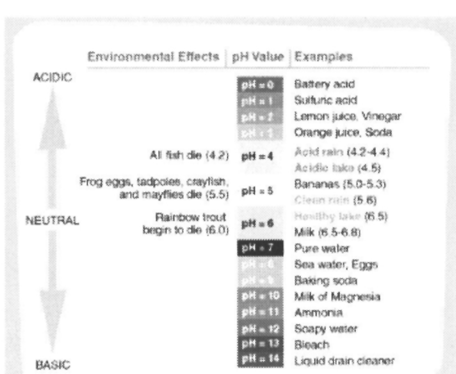
1. Yes, a cancer risk of 3 X 10^{-4} means that the increased risk of cancer from exposure to an additional 15 mrem per year of radiation is 3 extra cancers per 10,000 people or a person's chance of getting cancer is increased by 0.03%.
2. The 15 mrem per year value is actually not an exposure value. It is an effective dose value in milli ($1/1000^{th}$) roentgen equivalent man (rem) per year. This calculation is complicated because it combines the amount of radiation absorbed and the medical effects of that type of radiation. If you are exposed to 15 mrem per year, then your increased risk of cancer from that exposure is about 3 X 10^{-4} according to the EPA. There are many different specific scenarios of type and length of time of radiation exposure that could be calculated to equal an extra 15 mrem per year.
3. TASC would not make the assumption that EPA would use an absorbed dose of 15 mrem per year as the cleanup level for playgrounds. EPA makes site-specific determinations for cleanup goals.
4. No, in a risk assessment the risk of cancer from toxicity to the compound would be additional to the risk of cancer from exposure to the radiation.

Q9: In the TASC fact sheet about ground water, it says that thorium becomes more mobile under acidic conditions. Is the ground water at the site acidic enough to cause thorium to become mobile?

A9: No, the pH (a measure of acidity) of ground water at the West Lake Landfill is nearly neutral, which is a pH of 7, not very acidic (pH between 0 and 7). Also, ground water sampling indicates that thorium is not mobilizing at any significant rate from soil into ground water at the site. Data from the October 2013 ground water sampling report and a pH comparison diagram, as well as information about the alkalinity of the ground water samples are shown below. The high alkalinity (see details below) of the ground water has the capacity to keep the ground water at a stable pH.

Appendix B.3. of West Lake Landfill October 2013 Ground Water Monitoring Report (on CD ROM)
Herst & Associates, Inc - Field Information Logs (Part 2)

2013 Date	Well	Temp Deg C	pH	
7-Oct	D-3	17.3	6.85	(page 184 of Appendicies A-C of October 2013 GW report)
8-Oct	D-6	17.4	6.97	
1-Oct	D-12	17.9	6.76	
7-Oct	D-13	16.0	7.15	
15-Oct	D-14	23.5	6.75	
3-Oct	D-81	15.3	6.7	
8-Oct	D-83	16.3	6.92	
9-Oct	D-85	16.0	6.85	
2-Oct	D-87	16.9	6.84	
8-Oct	D-93	19.5	6.83	
7-Oct	I-4	17.3	6.95	
8-Oct	I-9	20.3	6.53	
1-Oct	I-11	18.0	6.74	
1-Oct	I-62	16.3	7.12	
15-Oct	I-65	13.9	7.22	
9-Oct	I-66	14.5	6.88	
3-Oct	I-67	17.3	6.78	
4-Oct	I-68	17.0	6.52	
3-Oct	I-73	21.8	6.54	
4-Oct	LR-100	17.1	6.69	
2-Oct	LR-103	18.8	6.77	
2-Oct	LR-104	16.9	6.69	
	LR-105	not able to sample		
3-Oct	MW-102	17.6	7.6	
4-Oct	MW-103	19.6	6.89	
3-Oct	MW-104	17.6	6.73	(page 234 of Appendices A-C of October 2013 GW report) final pH record is on page 352



Source: EPA (http://www.epa.gov/acidrain/education/site_students/phscale.html)

TestAmerica Laboratory Report
Alkalinity Results for August 2012, April 2013, July 2013 and October 2013

Alkalinity resluts ranged from 210 to 3500 mg/L.

ALKALINITY (From the TestAmerica October 30, 2013 report to EMSI)

Samples MW-103 (160-4000-1), PZ-103-SS (160-4000-2), PZ-303-AS (160-4000-3), I-68 (160-4000-4), PZ-207-AS (160-4000-5), LR-100 (160-4000-6), PZ-104-KS (160-4000-7) and DUP 04 (160-4000-8) w ere analyzed for alkalinity in accordance w ith EPA Method 310.1. The samples w ere analyzed on 10/08/2013 and 10/09/2013.

No difficulties w ere encountered during the alkalinity analysis.

All quality control parameters w ere w ithin the acceptance limits.

Alkalinity is a measure of the capacity of water or any solution to neutralize or "buffer" acids. This measure of acid-neutralizing capacity is important in figuring out how "buffered" the water is against sudden changes in pH. Alkalinity is usually reported as "mg/L as calcium carbonate ($CaCO3$) for convenience.

Typical Alkalinity Ranges

	(mg/L $CaCO_3$)
Rainwater	< 10
Typical surface water	20 - 200
Surface water in regions with alkaline soils	100 - 500
Groundwater	50 - 1000
Seawater	100 - 500

Source: http://water.me.vccs.edu/exam_prep/alkalinity.html

For the 4 ground water monitoring events, alkalinity was reported at values of 210 to 3500 mg/L.

Q10: What compounds were analyzed for in ground water sampling events?

A10: TASC provided the list to the CAG Board for distribution to interested community members. You may also contact Terrie Boguski at tboguski@skeo.com to request an electronic copy of the list.

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